



US005986337A

United States Patent [19]

Takagi et al.

[11] Patent Number: **5,986,337**
[45] Date of Patent: **Nov. 16, 1999**

[54] **SEMICONDUCTOR ELEMENT MODULE
AND SEMICONDUCTOR DEVICE WHICH
PREVENTS SHORT CIRCUITING**

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[21] Appl. No.: 09/138,562

[22] Filed: Aug. 24, 1998

[30] Foreign Application Priority Data

Nov. 17, 1997 [JP] Japan 9-315260

[51] Int. Cl.⁶ H01L 23/48

[52] U.S. Cl. 257/693; 257/697; 257/730;
257/692

[58] Field of Search 257/697, 692,
257/693, 698, 730

[56] References Cited

U.S. PATENT DOCUMENTS

4,868,638 9/1989 Hirata et al. .
5,398,165 3/1995 Niinou .
5,567,984 10/1996 Zalesinski et al. .

FOREIGN PATENT DOCUMENTS

62-163347 7/1987 Japan 257/697

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|-----------|--------|-------|---------|
| 63-174344 | 7/1988 | Japan | 257/697 |
| 1-39051 | 2/1989 | Japan | 257/697 |
| 1-60542 | 4/1989 | Japan | |
| 2-29538 | 2/1990 | Japan | |
| 4-146652 | 5/1992 | Japan | |
| 4-199556 | 7/1992 | Japan | 257/697 |
| 5-102348 | 4/1993 | Japan | 257/693 |
| 5-144962 | 6/1993 | Japan | 257/697 |

OTHER PUBLICATIONS

Article issued by Ohm, "Handbook for Electronics and Communication Engineers," *Electric-Communication Hand Book*, dated Mar. 30, 1979, cover pages, and p. 577.

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[57]

ABSTRACT

A semiconductor element module includes a package, a semiconductor element arranged on the package, and a plurality of leads provided on sides of the package so that an opening end of each the lead is oriented to the side of a package attaching plane, and serving to connect the semiconductor element to an external circuit; wherein a level difference is provided on the side of the package attaching plane of each of package sides so that a space is formed from each the plurality of leads.

10 Claims, 6 Drawing Sheets

